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[Title of the Invention] Imaging method and apparatus thereof
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[Title of the Invention] Imaging method and apparatus thereof

[Claims]

[Claim 1] An imaging method, characterized as comprising:

a display step for displaying an image sent from an imaging apparatus;

a command input step for inputting, based on the image displayed in the display step, a command specifying the operation of the imaging apparatus;

a feature amount extraction step for extracting, with regards to the inputted command in the command input step, the feature amount of a predetermined feature of an image section of the displayed image in the display step; and

a control step for controlling, based on the extracted feature amount in the feature amount extraction step and the inputted command in the command input step, the imaging apparatus.

[Claim 2] An imaging method according to Claim 1, characterized as having the command which is gesture information inputted from a pointing device.

[Claim 3] An imaging method according to Claim 1, characterized as having an additional step for displaying the gesture information on the same face as the face on which the image in the display step is displayed.

[Claim 4] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so that a new image is displayed with the center of the currently-displayed image designated as the center of the new image.

[Claim 5] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to move the currently-displayed image to an arbitrary position.

[Claim 6] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to put the currently-displayed image in focus on an arbitrary point.

[Claim 7] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to move the imaging apparatus in an arbitrary direction.

[Claim 8] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom in on an arbitrary region.

[Claim 9] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom in on the currently-displayed image for an arbitrary size with an arbitrary region of the image newly designated as the center.

[Claim 10] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom out of the currently-displayed image with an arbitrary region newly designated as the center.

[Claim 11] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom out of the currently-displayed image for an arbitrary size with an arbitrary region of the image newly designated as the center.

[Claim 12] An imaging method according to Claim 3, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so that the apparatus reciprocates within an arbitrary section of the trajectory.

[Claim 13] An imaging method according to Claim 3, characterized as

having the gesture information which includes gesture information for controlling the imaging apparatus so that the apparatus has a circular motion with a predetermined rate.

[Claim 14] An imaging method according to Claim 1, characterized as having the predetermined feature which is information of types of colors representing the image section regarding the command inputted in the command input step and information of the position of the region represented by the representative types of colors in the image section.

[Claim 15] An imaging method according to Claim 14, characterized as having the types of colors which are hues.

[Claim 16] An imaging method according to Claim 1, characterized as having:

the control step for controlling the imaging apparatus, based on the feature amount extracted in the feature amount extraction step and the command inputted in the command input step, so that the imaging apparatus is controlled with the predetermined amount of control corresponding to the command inputted in the command input step, and thus so that, within the new image obtained by the aforementioned control, the controlling of the imaging apparatus with the predetermined amount of control is repeated until the feature amount of the image region regarding the command inputted in the command input step comes to be almost equal to the feature amount extracted in the feature amount extraction step.

[Claim 17] A control imaging apparatus, characterized as comprising:

a display means for displaying an image sent from an imaging apparatus;

a command input means for inputting, based on the displayed imaged in the display step, a command specifying the operation of the imaging apparatus;

a feature amount extraction means for extracting, with regards to the command inputted in the command input step, the feature amount of a predetermined feature of an image section of the displayed image in the

display step; and

a control means for controlling the imaging apparatus, based on the feature amount extracted in the feature amount extraction step and the command inputted in the command input step.

[Claim 18] An imaging control apparatus according to Claim 17, characterized as having the command which is gesture information inputted from a pointing device.

[Claim 19] An imaging control apparatus according to Claim 17, characterized as additionally having the apparatus which comprises a means for displaying the gesture information on the same face as the face on which the image in the display step is displayed.

[Claim 20] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so that a new image is displayed at a position designating the center of the currently-displayed image as the new center.

[Claim 21] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to move the currently-displayed image to an arbitrary position.

[Claim 22] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to put the currently-displayed image in focus on an arbitrary point.

[Claim 23] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to move the imaging apparatus in an arbitrary direction.

[Claim 24] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom in on an

arbitrary region.

[Claim 25] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom in on the currently-displayed image for an arbitrary size with an arbitrary region of the image newly designated as the center.

[Claim 26] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom out of the currently-displayed image with an arbitrary region of the image newly designated as the center.

[Claim 27] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so as to zoom out of the currently-displayed image for an arbitrary size with an arbitrary region of the image newly designated as the center.

[Claim 28] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so that the apparatus reciprocates within an arbitrary section of the trajectory.

[Claim 29] An imaging control apparatus according to Claim 19, characterized as having the gesture information which includes gesture information for controlling the imaging apparatus so that the apparatus has a circular motion with a predetermined rate.

[Claim 30] An imaging control apparatus according to Claim 17, characterized as having the predetermined feature that is information of types of colors representing the image section regarding the command inputted in the command input step and information of the position of the region represented by the types of colors in the image section.

[Claim 31] An imaging control apparatus according to Claim 30, characterized as having the types of colors which are hues.

[Claim 32] An imaging control apparatus according to Claim 17, characterized as having:

the control means for controlling the imaging apparatus, based on the feature amount extracted in the feature amount extraction step and the command inputted in the command input step, so that the imaging apparatus is controlled with a predetermined amount of control corresponding to the command inputted in the command input step, and thus so that, within a new image obtained by the aforementioned control, the controlling of the imaging apparatus with the predetermined amount of control is repeated until the feature amount of the image region regarding the command inputted in the command input step comes to be almost equal to the feature amount extracted in the feature amount extraction step.

[Claim 33] An imaging control apparatus according to Claim 17, characterized as having the imaging apparatus and the imaging control apparatus as independent entities.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an imaging method and the apparatus thereof.

[0002]

[Prior Art]

Recently, TV conferences and desktop conferences via a public line or an exclusive line have been held among remote locations. Camcorders used for such a conference include ones to be fixed at a fixed spot and others to be manipulatable with zooming, panning and the like from a remote location.

When a camcorder is operated from a remote location, any of the following methods has been used. In on method, an command for orientation upward, downward, rightward and leftward, a command for zooming, as well as a command for focusing have been sent while

monitoring a displayed image. In the other method, data are selected and sent through touching icons corresponding to the data.

[0003]

As disclosed in Japanese Patent Laid-Opened Official Gazette No. Hei. 6-205409, by pointing a graphic bar and the like provided at the lower or right section in the displayed screen, an angle corresponding to the graphic bar and the like can be sent as a command. The calculation in this event is performed based on a focal distance and a field angle sent from the camcorder.

For a document, it has been also suggested to provide panning and zooming operations by specifying, through manipulating a mouse, a center image and a region of a document to be imaged.

[0004]

[Problem to be Solved by the Invention]

It is easy to point on a screen and to specify a image and a region through manipulating a mouse. However, when additional commands are required, or when an unknown image requires specification of a region existing outside a displayed image and orientation towards such a region, use of other commands and manipulation of keys need to be added .

[0005]

A conventional system calculates a field angle by receiving information (e.g., focal distance) from an object to be targeted. However, with a simple system which is given no specific information from a camcorder at a remote location, it is difficult to automatically satisfy an appropriate field angle.

The present invention was made in view of the above conventional example. It is an objective of the present invention to provide an imaging method and the apparatus thereof that can control the imaging apparatus easily and appropriately without identifying physical parameters in the imaging apparatus.

[0006]

[Means for Solving the Problem]

In order to achieve the above objective, the imaging method and the apparatus thereof according to the present invention includes: a display step for displaying an image sent from an imaging apparatus; a command input step for inputting , based on the imaged displayed in the display step, a command specifying the operation of the imaging apparatus; a feature amount extraction step for extracting, with regards to the command inputted in the command input step, the feature amount of a predetermined feature of an image section of the image displayed in the display step; and a control step for controlling the imaging apparatus, based on the feature amount extracted in the feature amount extraction step and the command inputted in the command input step.

[0007]

Another invention includes: a display means for displaying an image sent from an imaging apparatus; a command input means for inputting, based on the image displayed in the display step, a command specifying the operation of the imaging apparatus; a feature amount extraction means for extracting, with regards to the command inputted in the command input step, the feature amount of a predetermined feature of an image section of the image displayed in the display step; and a control means for controlling the imaging apparatus, based on the feature amount extracted in the feature amount extraction step and the command inputted in the command input step.

[0008]

[Embodiments of the Invention]

A camcorder operation command is issued through comparing an original image with an actual image, in accordance with the gesture inputted via a pen, so that the camcorder move in a specified direction or to a position where the size of the actual image comes to a specified size.

(Embodiment 1)

Fig. 1 is a view showing the structure of a camcorder control apparatus of

one embodiment according to the present invention.

[0009]

A display control section 1 provides a display control for displaying contents of an application, or an image from a built-in camcorder, or an image sent from a remote location via various communication means.

A display apparatus 2 is composed of a CRT, liquid crystal and the like. The reference numeral "3" denotes a pen input means (e.g., a digitizer) which is integrated with a display apparatus.

[0010]

The reference numeral "4" denotes a gesture command analysis means for analyzing an inputted command based on the shape, position, size, direction and the like of the line trajectory inputted via the pen input means.

The reference numeral "5" denotes a feature extraction means for extracting a feature from the image received via communication. The reference numeral "6" denotes a reference buffer for storing the feature of the image to be targeted when a gesture command is specified via the pen input means.

[0011]

The reference numeral "7" denotes an actual image buffer for storing the image feature of an actual image.

The reference numeral "8" denotes a comparison means for comparing the reference with the actual image in accordance with the gesture command to calculate the achievement of the command. The reference numeral "9" denotes a camcorder operation command control means for issuing a command in accordance with a result of the comparison so that control corresponding to a displayed screen is fed back to the camcorder. The command is sent to a built-in camcorder or a camcorder at a remote location.

[0012]

Fig. 2 shows the structure of the camcorder apparatus.

The reference numeral "10" denotes a camcorder section in which a light-sensitive element (e.g., a CCD) receives an image which has been formed via a lens and in which the image is converted to a signal according to a standard signal method (e.g., a NTSC) or to a digital signal so as to be sent to the main body.
The reference numeral "11" denotes the body or an external I/O for receiving a control command sent from a remote location.
[0013]
The reference numeral "12" denotes a camcorder control section for analyzing the command to control each device.
The reference numeral "13" denotes a horizontal movement motor for panning the camcorder. The reference numeral "14" denotes an inclined movement motor for providing the movement in the longitudinal direction.
Next, Fig. 3A shows an example of the internal block of an information processing system in which the camcorder section is integrated with the camcorder control body.
[0014]
The reference numeral "15" denotes a 32 or 16 bit CPU for executing the control of the entire machine and an application.
The reference numeral "16" denotes a peripheral I/O controller for controlling a CPU and a peripheral I/O handling control of interrupt, serial or parallel communications, a RTC and the like).
The reference numeral "17" denotes a RAM/ROM to be used for a control execution program or to be as a work region.
[0015]
The reference numeral "18" denotes a hard disc (HDD) for storing an application and user's data.
The reference numeral "19" denotes a digitizer for specifying a region in a displayed image and for converting a pen trajectory used for selection of a menu and for inputting characters to values on a coordinate.
The reference numeral "1" denotes a display controller for having a

display apparatus (liquid crystal) 2 display an image on the screen.

[0016]

The reference numeral "20" denotes an audio controller for controlling the reproduction of sounds via a microphone/speaker 21.

The reference numeral "12" denotes a camcorder control section for analyzing the camcorder command which has been specified by an external device or by the main body as described above, and subsequently for controlling the camcorder.

The reference numeral "22" denotes a communications control section for controlling the exchanging of data between the camcorder and external machines (e.g., computer, FAX) through a telephone line via a modem 23. Instead, the communications also may be provided via LAN or the like. A communication medium to be used may be cable or wireless. Data may be in accordance with an analog method or a digital method.

[0017]

Fig. 3B shows the appearance of the entire apparatus of Fig. 3A.

Fig. 4 shows the list of gesture commands to be actually used.

In Fig. 4, (1) represents a command for moving the camcorder so as to designate a location of a given point as the center of the image. The gesture means tapping the point once.

A point shown in the gesture column represents a tap position. A bold arrow means paying attention to the location of this point. The bold arrow is not to be actually inputted.

[0018]

In Fig. 4, (2) represents a command for moving a point from an initial pen-down point to a pen-up point. The gesture means the tapping and dragging of the point.

The related bold arrow shows the point to be tapped and is not to be actually inputted. In Fig. 4, (3) represents a command for focusing on the point. The gesture means tapping the spot twice.

[0019]

In Fig. 4 (3), two points are juxtaposed in some distance. However, the pairing is used for a reference purpose only, and the pairing means tapping a single point represented by the pairing twice. The bold arrow in Fig. 4(3) means paying attention to the location of the point, and the arrow is not to be actually inputted.

In Fig. 4, (4) represents a command for moving the camcorder in the direction written with a pen input means and stopping the camcorder through inputting with a tap. The gesture is shown by an arrow and a tap.

[0020]

In Fig. 4, (5) represents a command for having the camcorder to zoom in on a region surrounded by the two arrows. The gesture is shown by the two arrows.

In Fig. 4, (6) similarly represents a command for having the camcorder zoom in on an initially-drawn small circle so as to enlarge the small circle to the same size as one of a large circle which is drawn subsequently. The gesture is represented by a small circle, a small arrow and a large circle.

[0021]

In Fig. 4, (7) represents a command for having the camcorder zoom out with an initially-pointed point designated as the center and for stopping the camcorder when a tap is inputted. The gesture is represented by a pig tail and a tap.

In Fig. 4, (8) represents a command for having the camcorder zoom out of an initially-drawn large circle so as to decrease the size of the circle to the same size as one of the small circle which is drawn subsequently. The gesture is represented by a large circle, an arrow and a smaller circle.

[0022]

Methods for interpreting these commands are an extension of conventional gesture commands to be used for a pen computer, and thus will not be described in detail here.

The controlling of a camcorder 5 of Fig. 5 will be explained with reference

to the related flowchart.

First, Step S1 reads the coordinates which have been inputted with a pen via a digitizer.

Next, Step S2 interprets which command is specified in what manner.

[0023]

Step S3 determines whether or not such a command that will be stopped by a tap input (e.g., (4) and (7) of Fig. 4) is being executed now. If the program is being executed, then Step S4 issues a stop command, and Step 4 is ended.

If the program is not being executed, Step S5 is pursued.

Step S5 performs a calculation for initializing to obtain a reference (which will be described later).

[0024]

Then, features of the image at a specified point are extracted.

The extraction of a feature performed by, for example, focusing on a 3×3 block in the vicinity of a specified point to extract representative hues (e.g., two hues) from a plurality of pixels included in the block. Then, information regarding the hue and the relative position between them in the block will be used as the above-described reference.

[0025]

In the above section, incidentally, a hue has been cited as an example of a block feature. However, a block feature is not limited to a hue. It goes without saying that characteristics of the color (e.g., brightness, chroma) also may be combined to be used as a block feature.

Next, in order to actually execute the gesture command, a control command to be initially given to the camcorder is calculated. For example, in order to put a tap point of (1) at the center of the image, the relation between the tap point and the center of the image is calculated to issue a provisional movement command.

[0026]

The provisional movement command means a command for moving the

camcorder by the unit of travel distance because the camcorder has not had information of a field angle or an actual travel distance to the tap point with regard to the camera section. Basically, by repeatedly issuing such a command for moving the camcorder by the unit of travel distance, the camcorder can be moved to the final target point.

Specifically, an exact travel distance of the camcorder cannot be calculated so long as the current situation in which the camcorder is in (e.g., a distance to the target, a lens field angle) is known. Thus, this embodiment provides feedback on the camcorder's movement while observing a feature of the image.

[0027]

A provisional movement command is calculated, for example, based on the distance in the X direction between a tap point and the center of an image, the distance in the Y direction between the tap point and the center of the image, a provisional field angle, and a provisional distance to the target.

A command (4) calculates the direction of an arrow, while commands (6) and (8) calculate the ratio between a larger circle and a smaller circle.

Step S6 eventually issues this calculated command to the camcorder at a remote location.

[0028]

Step S7 evaluates a feature of the current image. Then, Step S8 determines whether or not the current image comes equal to an image to be required by the gesture command. If the current image comes equal to an image corresponding to the gesture command, Step S9 issues a stop command, and then is ended. If not, Step S10 issues a correction command. It is likely that the above-described provisional constants cause errors while the camcorder is moving, and thus constant feedback is required. When the command is moving in the correct direction but has not yet got to the target, no correction command is issued.

[0029]

Since, as described above, a command can be given with a pen input means directly to a display while watching the display, the operation method can be easily understood.

With regard to remote control, furthermore, the above embodiment would control the camcorder based on an image sent from a remote location. Thus, the control would be performed with a conventional camera, and without adding anything else, if the camera is remotely controllable.

(Embodiment 2)

In the above-described embodiment, the camcorder stops operation, either when a provisional image agrees to the image required, or when a tap is inputted.

[0030]

On the other hand, an awareness system has been recently researched for parties at remote locations to mutually know the situation of one another when the parties collaborate. For example, when you call on your counterpart, you look for your counterpart around the room if your counterpart is not in. With a camera provided, you would similarly look around for your counterpart through the camera, if your counterpart is not in front of the display. In such a way, the awareness system aims to realize an everyday contact among remote parties.

[0031]

Since a camera in the above-described embodiment is operated in a single direction, such a camera cannot find parties, and also cannot be used for a monitoring purpose or the like. In contrast, this embodiment expands a gesture so further that the camera can continue moving until a stop command is inputted by a tap in response to a reciprocating motion, a circular motion or the like.

Examples of such a gesture are shown in commands (9) and (10) of Fig.4.

[0032]

First, Fig. 4 (9) represents a command for having a camera reciprocate at fixed speed within a range specified by the trajectory. The gesture is

shaped like an 8 placed in the lateral direction. Fig. 4(10) represents a command for moving a camera in circle at fixed speed, and the gesture is shaped like a double circle.

Fig. 6 shows a flowchart representing a control sequence according to this embodiment.

In Fig. 6, the same reference numerals will be used to designate the same steps as those in Fig. 5. Fig. 6 is different from Fig. 5 in that Step S11 is added to the control sequence. In the control process of Fig. 6, the camcorder is allowed to continuously move until a tap is inputted. Thus, with a reciprocating motion according to the command 4(9), when the camcorder reaches one extreme point, a feature representing the other extreme point instead is assigned as the feature to be referenced, and thus the orientation of the motion is changed towards the other extreme point. When the camcorder is having a circular motion, then the camcorder must constantly move in different directions. In this case, the circular motion of the camcorder is realized by setting a movement target for every short section dividing the circle so that the orientation of the camcorder can be switched continuously.

[0033]

By switching a target point constantly as described above, a camcorder could be continuously moved in a desired direction (e.g., reciprocating motion, circular motion) shown by a trajectory written by a user via a pen input means. It is noted that the present invention may be applied both to a system composed of a plurality of machines and to an apparatus consisting of one machine. It is also noted that the present invention can be applied when a program is provided to a system or an apparatus. In this case, a storage medium including a program according to the present invention constitutes the present invention. The program is retrieved from the storage medium to the system or the apparatus, and thereby the system or the apparatus can be operated in a predetermined manner.

[0034]

As described above, the embodiments according to the present invention allows:

1) a command to be issued directly to a display via a pen while monitoring the display, and thus a camcorder to be easily operated because the operation method is easy to understand;

2) a command to be performed without adding anything else if a conventional, remote-controlled camera is available, since the control is performed based on an image sent from the camera; and

3) a user's intention to be easily converted to the motion of the camera since the camera can be controlled continuously for circle and reciprocating motion.

[0035]

When an object to be imaged moves, it is likely that the above adjustment method based on an image feature does not identify a point to which the camcorder should be moved. To prepare for this case, a maximum movement value may be set in advance so that, when the movement of the camcorder for searching exceeds the maximum value to be set in advance, a message showing "point search failed" is displayed on a display screen to wait for the next command from the user.

[0036]

[Effect of the Invention]

As described above, the present invention can control the imaging apparatus easily and appropriately without knowing physical parameters of the imaging apparatus.

[Brief Description of Figures]

[Fig. 1]

Fig. 1 shows the function blocks of a camcorder control section of one embodiment according to the present invention.

[Fig. 2]

Fig. 2 is a block diagram illustrating a camcorder section controlled by the camcorder control section of Fig. 1.

[Fig. 3A]
Fig. 3A is a block diagram illustrating an information processing system in which the camcorder section is integrated with the camcorder control section.
[Fig. 3B]
Fig. 3B shows the appearance of the information processing system in which the camcorder section is integrated with the camcorder control section.
[Fig. 4B]
Fig. 4B shows the list of gesture commands.
[Fig. 5]
Fig. 5 is the flowchart of processing in a camcorder control section of Embodiment 1.
[Fig. 6]
Fig. 6 is the flowchart of processing in a camcorder control section of Embodiment 2.
[Description of Reference Numerals]

1	Display control
2	Display apparatus
3	Pointing device
4	Gesture command analysis means
5	Feature extraction
6	Reference buffer
7	Actual image buffer
8	Comparison means
9	Camcorder operation command control means
10	Camcorder section
11	External I/O
12	Camcorder control
13 and 14	Camcorder posture control motor
15	CPU

16	Peripheral I/0
17	Memory
18	Second storage apparatus
19	Digitizer
20	Audio control
21	Audio input and output
22	Communications control
23	Modem

[Name of Document] Drawing

Fig. 1

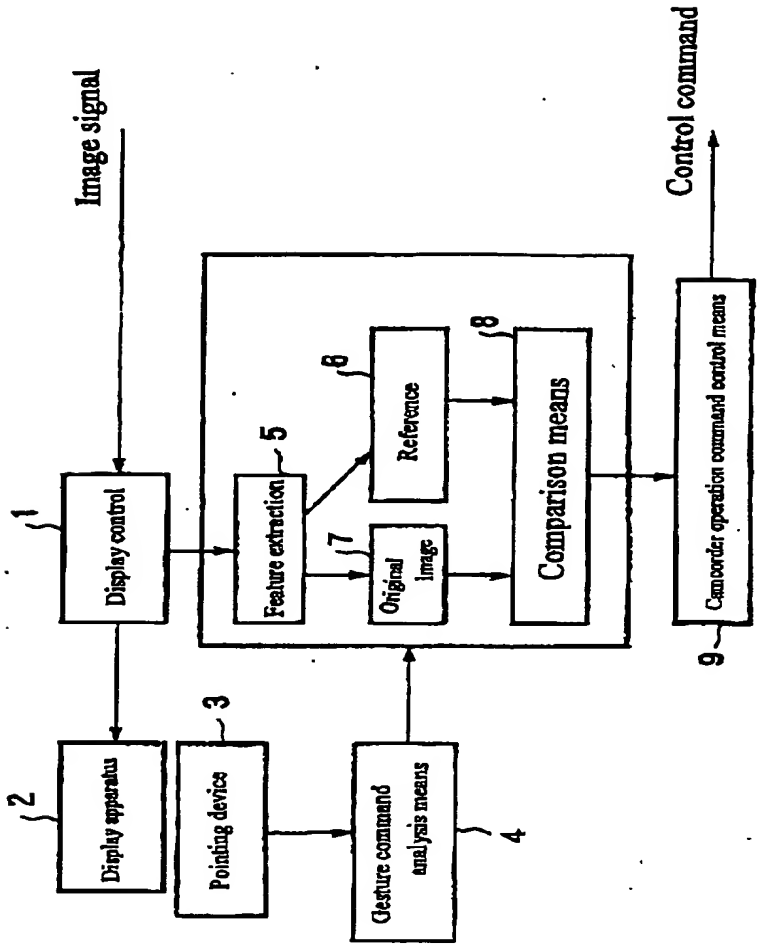


Fig. 2

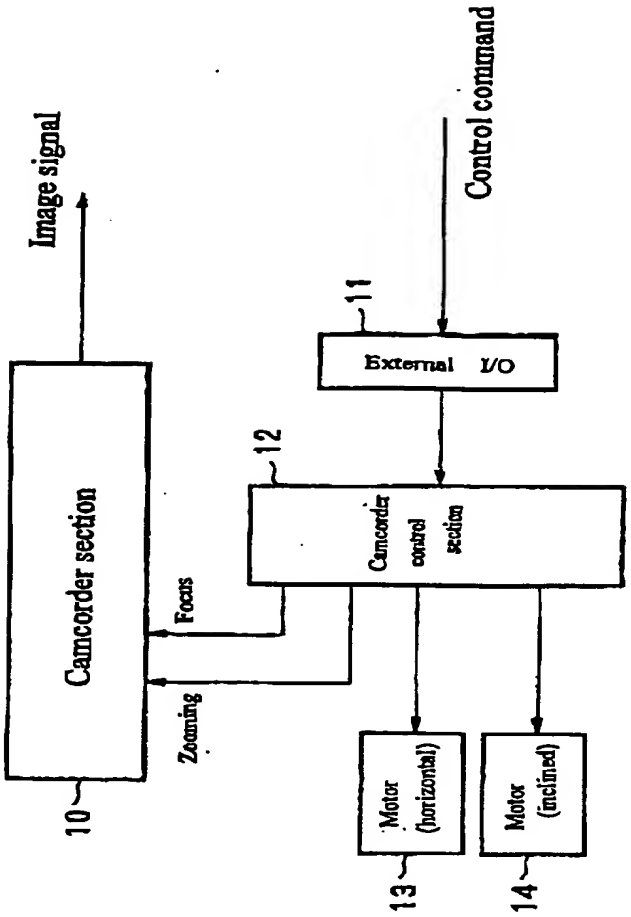


Fig.-3A

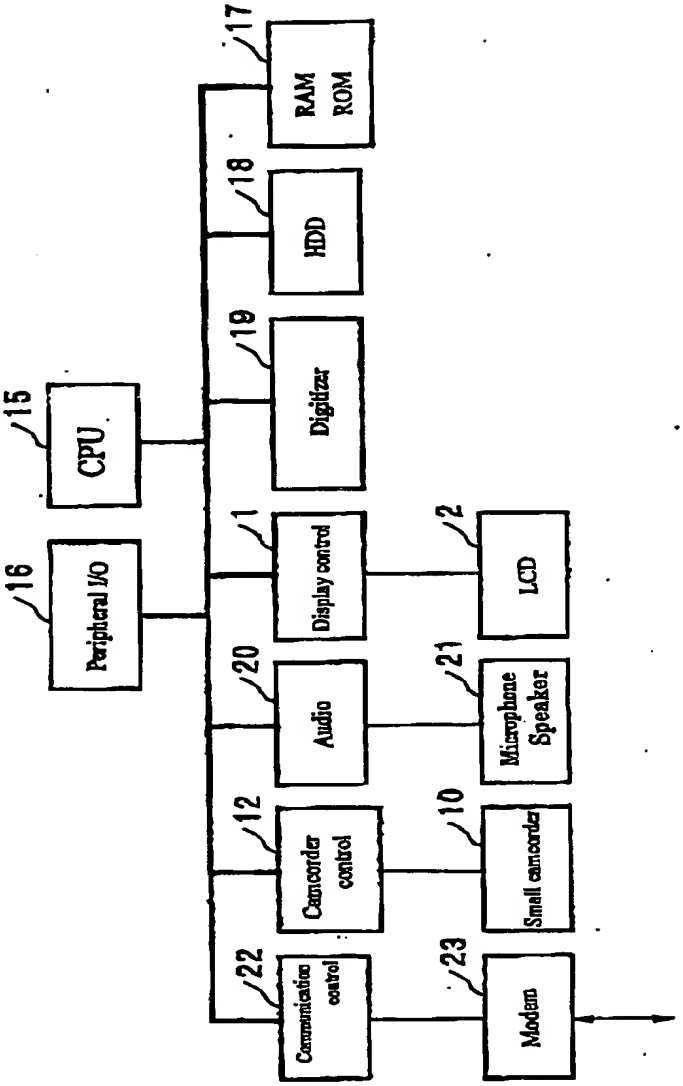


Fig. 3B

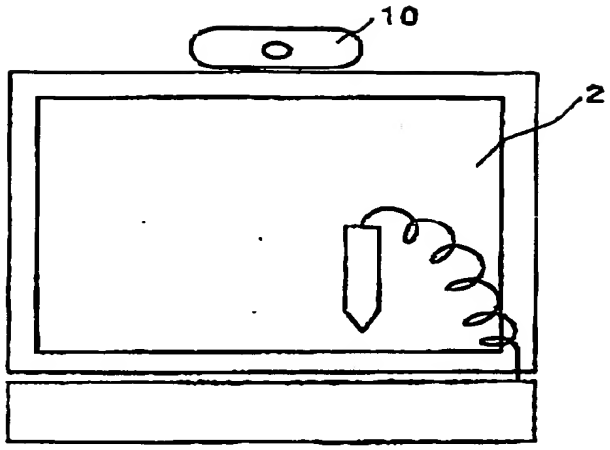


Fig.5

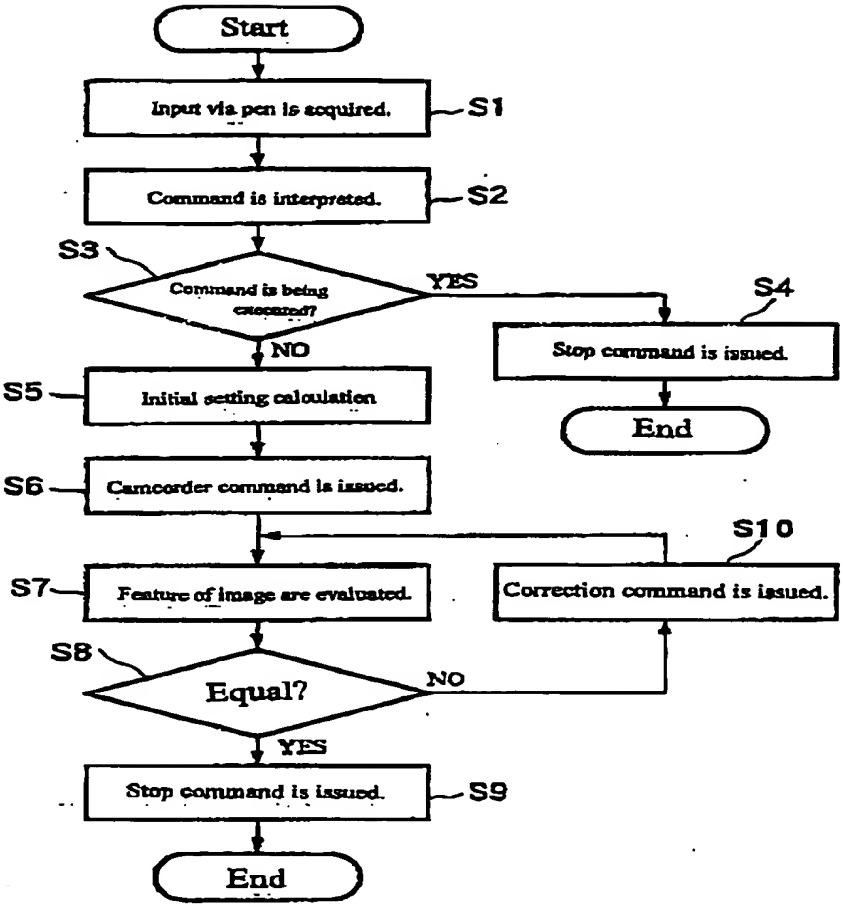
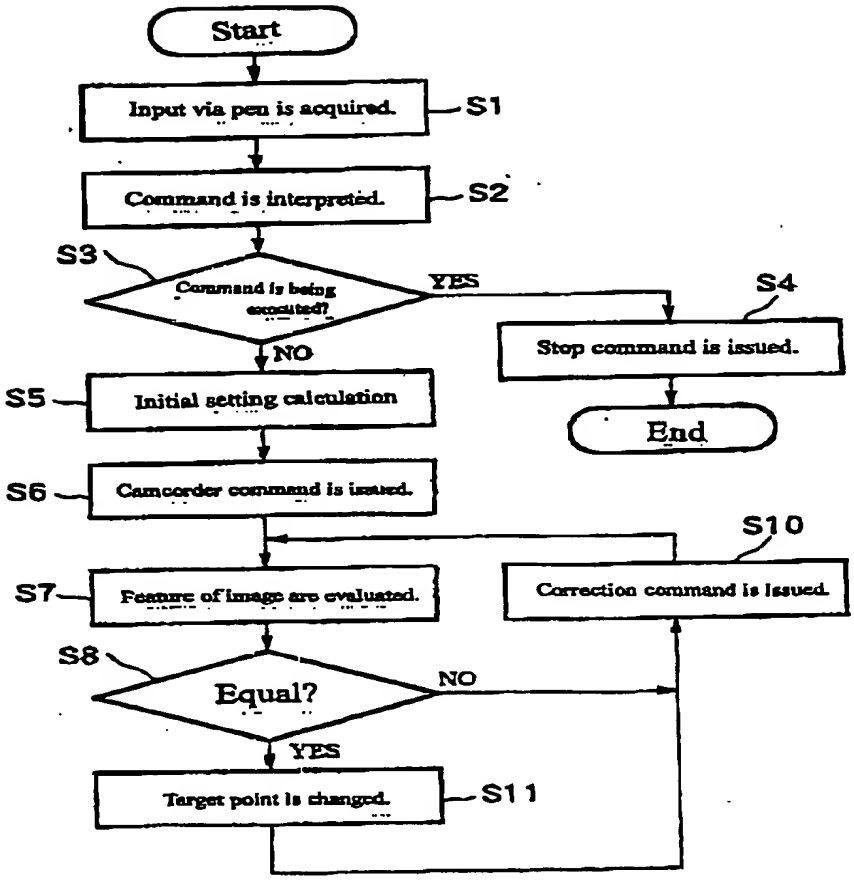


Fig. 6



[Document Name] Abstract

[Abstract]

[Problem] To provide an imaging method and the apparatus thereof that can control an imaging apparatus easily and appropriately without knowing physical parameters of the imaging apparatus.

[Means for Solving Problem] An image sent from the imaging apparatus is displayed. Based on the displayed image, a command for specifying operation of the imaging apparatus is inputted (S1). Then, the amount of a predetermined feature of the image section on the displayed image with regards to the inputted command is extracted (S3 and S5). Based on the extracted feature amount and the inputted command, the imaging apparatus is controlled (S6, S7, S8, S10, and S9).

[Selected Drawing] Fig. 5

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